3.3 HYDROLOGY AND WATER RESOURCES

The project area is predominantly a high elevation desert; therefore, water resources are limited and of special importance. The protection of water resources is a primary concern to federal, state, and local government, as well as to residents. Additionally, the region presents some characteristic flood hazards that potentially could affect the positioning of transmission towers to avoid effects that would compromise the reliable operation of the line. This section describes the flood hazards and potential impacts to water resources.

3.3.1 AREA OF ANALYSIS AND METHODOLOGY

The area of analysis for hydrology and water resources includes the area within 2 miles of the transmission line route alternatives for surface water resources, springs and wells, and flood inundation hazard areas. For flash flood hazard, the project area includes the catchment area for stream segments crossed by the route alternatives.

The method of analysis was predominantly an interpretation of large scale (1:24,000) USGS topographic quadrangles to identify water resources and evaluate hazards. The project is not consumptive of water resources, except for a small demand for water to construct the foundations of transmission towers and water used for dust suppression during the construction phase. Therefore, detailed evaluations of available water supplies for the project were deemed unnecessary for the analysis.

REGULATORY FRAMEWORK

Water Supply

Water resources in the project area are regulated under federal, state, and local laws, regulations, and ordinances. Given the nature of the proposed facilities and the absence of a need for securing a long-term water supply for the project, water rights are not a significant issue for the project. The project is unlikely to conflict with existing water rights because it does not demand sustained use of water resources. The primary issue would be the potential for the project to impair access to a source of water, such as a water well or spring. However, given the leeway to site transmission towers and other facilities to avoid wells or other access to water resources, the project likely could proceed with minimal need to negotiate water rights with landowners or secure significant permits for use or diversion of waters. The Nevada Division of Water Resources (NDWR) requires approval of water rights for construction use of water by diversions from a stream or use of a well. Similarly, if dewatering is required for construction, a Waiver Request must be approved by NDWR. Applicable regulatory requirements are related primarily to protection of surface water resources and water quality. Water appropriation permits are issued by the Nevada State Engineer of the NDWR.

Clean Water Act

General water quality is protected under the federal Clean Water Act. As federal law, it applies to all parts and locations of the project in all its phases. Project construction would require securing a National Pollutant Discharge Elimination System (NPDES) permit pursuant to 40 CFR, Parts 122-124. The NPDES permit would be supported by the preparation of a Stormwater Pollution Prevention Plan (SWPPP) for construction of the facilities. The SWPPP would be comprised of BMPs for construction of the facilities. NDPES permits are administered by the NDEP.

Compliance with the federal Clean Water Act also would be required if the project would result in alteration of or discharges into watercourses and water bodies (Waters of the United States) and wetlands. The U.S. Army Corps of Engineers (USACE) and EPA regulate the placement of fill into waters of the United States under Section 404 of the act. Waters of the United States include lakes, rivers, streams and their tributaries, and wetlands.

Wetlands are defined for regulatory purposes as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to grow in saturated soil (33 CFR 328.3, 40 CFR 230.3). For a wetland to qualify as jurisdictional by the USACE and therefore be subject to Section 404 regulation, the site must support a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology. Evidence of historic presence of wetlands that have since become degraded also may result in a Section 404 compliance requirement.

Waters of the United States in the project area include perennial and intermittent drainages that drain to navigable waters, such as flowing rivers, streams, and other drainage features with defined channel characteristics. The Sacramento District of the USACE would be responsible for issuing the permit. An individual permit for the project or a nationwide permit may be required at the discretion of the USACE and EPA. Consultation with the U.S. Fish and Wildlife Service (USFWS) is required to secure the permit. The USACE also may consult with the Federal Emergency Management Agency (FEMA) regarding flood hazards associated with proposed facility sites in hazard zones. A specific permit is not required with regard to minimizing flood hazards; however, avoidance of undue hazard is the prudent course of action.

Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)

In addition to compliance with the Clean Water Act, the decision-makers for the project would be required to demonstrate compliance with two federal Executive Orders. Executive Order 11988 – Floodplain Management requires federal agencies to prepare a floodplain assessment for actions located within or affecting floodplains. Similarly, Executive Order 11990 - Protection of Wetlands requires federal government agencies to support a policy of minimizing "the destruction, loss, or degradation of wetlands." The intent of these Executive Orders is to minimize impacts on floodplains and wetlands. The Executive Orders seek to prevent development in floodplains and wetlands unless it is absolutely necessary and other alternatives are not available. For this project, placing transmission towers or other project elements in wetlands and floodplains would be avoided unless no alternative site is available.

Nevada Water Pollution Control Law

At the state level, the NDEP would require a Section 401 Water Quality Certification and Stormwater Discharge Permit. These permits likely could be combined with the permits described above. NDEP also is responsible for administration of the Nevada Water Pollution Control Law, which provides state authority to protect water quality for public use, wildlife, existing industry, agriculture, and the beneficial economic development of the state.

NDEP defines waters of the state to include surface watercourses, waterways, drainage systems, and underground water. NDEP administers the NPDES permits for surface stormwater water discharges but also requires that discharges into subsurface waters be controlled if a potential for contamination is present. NDEP requires a zero-discharge permit for projects with potential to contaminate groundwater. Drinking water protection under the Safe Drinking Water Act is administered by the EPA, which has granted the enforcement of the act to the Nevada Division of Health.

If required, a Grading Permit from each of the counties in which construction would occur would be applied for. The Grading Permits would address similar water quality protection issues and requirements to those needed for the federal and state permits. SPPC would include these permits in the COM Plan.

The permit issues relevant to protection to water resources would be addressed in SPPC's planned COM Plan, which would follow the EIS. Three key components of the COM Plan would address hazards and issues related to protection of water resources:

- A Hazardous Materials Management and Spill Prevention Plan (HMMSPP) would be required for the construction and long-term operation of the proposed facilities. The HMMSPP would include provisions to prevent discharges of hazardous and toxic materials into water bodies, among other requirements to protect air quality, health, and safety. Thus, approval of the HMMSPP would be linked to the SWPPP.
- SPPC would prepare a Stream Crossing Plan (SCP). The SCP is not a specific permit requirement; however, crossing of flowing streams and numerous dry channels would occur if the project were approved. The SCP would address measures to protect water quality, flow conditions in the channels, and associated biological and cultural resources in the area of potential effect (APE). Thus, the SCP addresses the same issues that comprise the various permit requirements to protect water resources.
- A Soil Conservation and Erosion Control Plan (SCECP) would address the issues related to soil erosion hazards and prevention of sediment discharges into water bodies and watercourses. The SCECP would have many of the same elements as the SWPPP and would demonstrate the plan for compliance with the BLM's Right-of-Way Guide Stipulations, BLM Handbook H-2801-1, Chapter II C.6.a to e.

3.3.2 AFFECTED ENVIRONMENT

This section presents an overview of the project area's water resources and the nature of flood hazards. The information is focused on issues and resources related specifically to potential project impacts.

GENERAL HYDROLOGIC SETTING

The Falcon to Gonder project is located in the Great Basin subsection of the Basin and Range Physiographic Province. The Great Basin subsection is noted as an arid geographic area with internal drainage. Because of the regional physiography and as no stream in the region is sufficiently large to sustain flow to the sea, the entire region is characterized by internal drainage. All rivers end in intermittent dry lakes known as playas, which form in the low-lying basins. The Great Basin is characterized by a linear arrangement of mountain ranges interspersed with valleys. The Great Basin is further divided into sub-areas; the project would be located wholly within the Central Area, which has similar characteristics to the Province but of generally higher altitude. Streamflow regime in the region is highly variable and depends on climatic, topographic, soil, and size characteristics of the catchment.

PRECIPITATION AND EVAPORATION

The region as a whole receives generally less than 10 inches of precipitation annually. Snowfall averages about 10 inches for the general region, which accounts for approximately one inch of the total average annual precipitation. In general, May through November is the drier period, and December through April is the wetter period. Monsoonal events in summer can cause episodic thunderstorms, which can result in destructive flash floods. Precipitation is generally in the form of snow in the winter. While precipitation is generally low in the region, the distribution of precipitation is strongly influenced by topography. The higher mountain ranges receive greater precipitation, coupled with lower rates of evaporation than the low-lying valleys. For example, precipitation records for the 1969-1973 period near Cortez (Table 3.3-1), located in a valley area at an elevation of approximately 5,000 feet, averaged 9.48

inches (BLM 1996). Beowawe (at an elevation of 4,696 feet) averages 6.44 inches annually based on long-term data collected since 1870 (with some data gaps). These stations are considered generally representative of lower elevation stations in the study region.

TABLE 3.3-1: MEAN MONTHLY PRECIPITATION (IN INCHES) FOR THE STATION AT CORTEZ MINE (1969 –1973)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
0.79	0.69	0.81	0.86	1.14	1.04	0.55	0.54	0.67	0.72	0.91	0.75	9.47

Source: BLM 1996.

Higher mountain ranges receive greater amounts of precipitation and snowfall. While data are few, it is roughly estimated that topographic elevations above 6,000 feet receive 6-12 inches average annual precipitation. Areas between 6,000 and 7,000 feet receive 12 to 15 inches, and zones 7,000 feet and higher receive 15 to 20 or more inches of average annual precipitation (BLM 1996). For example, Elko (at an elevation of about 5,100) feet receives about 9 inches average annual precipitation. Eureka (at about 6,600 feet) receives about 13.5 inches, and Midas (at about 7,200 feet receives) almost 19 inches of precipitation annually. Because of this topographic relationship to precipitation, all the significant streams in the region are sustained by runoff from the mountains. Streams fed by high mountain ranges with large catchments tend to have more sustained flow in springtime as a result of snowmelt and longer duration of spring flows. These flows drain to the valleys and either dry up or discharge into the playas or streams that drain into the Humboldt River. Monsoonal conditions from June through September can cause episodic thunderstorms, which can result in destructive flash floods.

The region has cold winters and hot summers. Evaporation is high from April to October when the region is hot. Pan evaporation data at Beowawe for the period 1981-1989 indicated an average evaporation of 57 inches for the April-October period (BLM 1996). That rate is about six times greater than the average annual precipitation at that location. Similar evaporation rates are characteristic of the entire study region for valley locations. Evaporation at higher elevations is expected to be less.

The distribution of precipitation and evaporation is reflected in the type of vegetation cover. Lower elevation areas are predominantly sagebrush and salt desert shrubs, whereas higher elevation areas support pinyon-juniper woodlands. Some of the highest ranges (e.g., the Ruby Mountains) have watercourses and lakes that contain abundant water year round. By contrast, the valley floor areas are drier. Where present, the playas are shallow and evaporate rapidly in the warm period. Surface water in the playas, if present at all, generally does not last beyond one water-year. Although the lakes are ephemeral, some playas have a large surface area when they contain water. None of the valley bottoms in the study region contain natural perennial lakes.

The arrangement of the mountains strongly affects distribution patterns of precipitation receipt and runoff. The region is characterized by a structural geologic system of upraised fault blocks forming semi-parallel mountain ranges separated by down-dropped inter-range valleys. In general, the mountains have steep slopes and shallow soils, conditions that promote rapid shedding of rainfall. By contrast, the valleys have been filled to great depths by alluvium derived from the erosion of the mountains. The valley areas absorb the runoff from the mountains, creating a widespread groundwater storage system. The linear arrangement of mountain ranges and valleys is aligned on a predominantly north-south axis. Some ranges, such as the Diamond Mountains, are oriented almost due north-south. Others, like the Cortez and Sulphur Spring Range, are oriented more northeast-southwest. The orientation of the ranges is reflected in the parallel arrangement of the intervening valleys, such as Crescent Valley and Pine Valley.

The relief between the mountain ranges and the adjacent valleys is substantial, typically on the order of 1,000 to 3,000 m. The base of each range commonly is fringed by alluvial fan aprons, which are inclined at low angle and stretch broadly to the flat-floored valleys. Faulting and tilting of the block mountains have created closed drainage; in some areas, there is no drainage outlet for the rivers and drainage ends in playas (e.g., Newark Lake is such a water feature). Much of the drainage pattern in the region was established during the Pleistocene Epoch, a more humid period that ended about 8,000 - 10,000 years ago. There is evidence of ancient large permanent lakes having formed at that time in some basins.

The onset of arid conditions at the close of the Pleistocene changed the nature of hydrologic conditions and the erosional processes shaping the land. The ancient lakes dried up. Erosion of the mountain ranges continued, with sediment transport from the higher elevations and deposition at the base of the mountains, but stream systems became less capable of transporting the material. Sediment volumes carried in mountain streams exceed the capacity and competency of rivers to transport them out of the local valleys. Extensive alluvial fans continued to form where the streams emerge from the mountain front onto the valley floor.

Each alluvial fan was constructed by the deposition of alluvium associated with the migration of the watercourses across the face of the fan over eons of time, a process that continues to the present. In some cases, subsequent erosion has left remnants of the fans from earlier depositional processes. Often during large runoff events, the locations of the active conveyance channels shift abruptly in response to the deposition of the sediment debris loads entrained in the water.[1] Over time, the individual fans eventually formed by adjacent watercourses coalesced to form almost continuous alluvial aprons surrounding the base of each mountain range. In some areas, the basal area of a mountain range is formed by erosion of the lower rock materials; the remnant feature is known as a pediment. Pediments typically have somewhat shallower soils than alluvial aprons, but the surface topographic expression is in general similar to that of alluvial aprons. The resulting topography as expressed in the current landscape is comprised of a broad, flat basin plain, typically formed by fine-grained sediment and having closed drainage. The lowest portion of closed basins may be occupied by a mud flat periodically occupied by a playa lake.

The flat basin plain gives way to a broad, gently inclined alluvial apron comprised of stratified coarse sediments leading up to the mountain front. At the mountain front, there is an abrupt steepening of slope where harder geologic materials (rock with a thin soil veneer) form the surface. The mountains have steep slopes with bedrock near the surface, and streams are commonly entrenched in narrow, v-shaped valleys. Immense variation is observed in topography and drainage from the preceding descriptive model of the landforms and drainage because of local geologic structure, rock, and soil, as well as topographic alteration from human use in an area. However, the model is useful to understanding the conditions that commonly affect drainage conditions in the region as a whole.

REGIONAL HYDROLOGICAL RESOURCES

In general, the supplies of surface water in the region are meager. Rivers are few and small, most commonly formed as short watercourses in the mountains that drain steeply to the adjacent valleys, where they seep into the sediments and evaporate. A large part of the study region is drained by the Humboldt River, which is the master stream of the region. Parts of Crescent Valley, Pine Valley, and Huntington Valley drain into the Humboldt River. It is also the only perennial river in the study region. Average annual discharge of the Humboldt River is quite variable.

Hunt (1967) estimated a flow on the order of 500,000 acre-feet per year. However, base flow data collected by the USGS in 1992 on the river at Beowawe indicated 17.9 cubic feet per second (cfs), with an additional 13 cfs of irrigation diversions for a total of 30.9 cfs; that translates to an estimated 22,327

[1] It is difficult to predict the location of active channel migration across the fan surface. For this reason, FEMA treats alluvial fan surfaces as being located in the 100-year flood hazard zone.

acre-feet-year for that year (BLM 1999). However, most of the study region basins have interior drainage. While few data exist on streamflow in the region, none match that of the Humboldt River. The loads of salt in the watercourses are likely to be generally similar to that of the Humboldt River, and similar if not higher salt concentrations exist in playa lakes. As a result, some of the playas have salt crusts. However, most playas consist of bare clay flats without salt crusts, and the salts are distributed throughout the mud.

Although present throughout the region, wetlands are located near the study corridor at only two locations: the crossing of the Humboldt River, and in an area on the flats west of Beowawe.

Watercourses in the mountains, where flows gather, generally have good water, and freshwater springs feed many watercourses. Water quality rapidly declines as the flows decrease in quantity as they flow into and through the valley areas. For example, water in Humboldt River contains 300 to 600 parts per million (ppm) of salts, whereas water in the Humboldt Lake (the river's eventual terminus, located west of the study region) contains at least 1,000 ppm salts (Hunt 1967). Water in some playas reaches over 4,000 ppm (Hunt 1967). Thus, much of the surface water supplies in valley segments of rivers and in the playas are not usable for domestic and livestock purposes.

The importance of fresh surface water and freshwater springs in the region for human use and wildlife cannot be overemphasized. Some streams and springs, however, do not contain potable water. Surface waters and groundwater vary substantially in quality. For example, in Crescent Valley surface waters from Indian Creek, Mill Creek, and Fire Creek revealed relatively low total dissolved solids (TDS) and alkaline pHs (8.05-8.46). Most trace and minor constituents were reported to be below NDEP standards (e.g., for aluminum, arsenic, silver, cadmium, mercury, and thallium). These constituents may be partly related to effects of past mining in those watersheds (BLM 1999).

Groundwater from Crescent Valley alluvium was generally of good quality, meeting most of the primary and secondary drinking water standards, and is suitable for livestock, irrigation, and mining uses (BLM 1999). The average concentration of manganese was the primary constituent that exceeded state water quality standards; however, maximum concentrations did not meet drinking water standards for a variety of constituents. Bedrock water quality was reported to be similar to that of the alluvial aquifer but with higher concentrations of mineral constituents. The average concentrations met the primary standards for drinking water (BLM 1999).

Natural hot springs are located in portions of the region, notably in Crescent Valley at Beowawe. These springs are sufficiently heated to support geothermal energy production facilities. Most hot springs have highly mineralized waters, limiting their use for drinking water and livestock watering. For example, samples of hot springs in Crescent Valley had high TDS and a pH of 6.8 to 8.5 (BLM 1999). Wells that draw from geothermal sources in general have similar TDS and pH characteristics to hot springs. These wells exceeded maximum contaminant levels for fluoride, manganese, magnesium, manganese, sulfate, and TDS, and had elevated levels of calcium, sodium, sulfur, and potassium. Wells are an important source of water in the region for domestic use and livestock watering.

Common Characteristics of Watercourses

Gradient of watercourses is an important indicator of constraints related to engineering requirements, erosion hazard, and potential slope instability. For purposes of mapping and consistency with the analysis of slopes (see Section 3.1, Geology and Minerals), watercourses are classified into four groups: low (under 1% gradient), gentle (1% to 5%), moderate (>5% - 15%), and high gradient (greater than 15%).

In general, most watercourses in the region have three primary segments. The upper watercourse is formed in the mountains. Moderate and high gradients are common. Base flow comes from springs in the rock formations. The source water comes from snowmelt in winter and spring, and some rainfall in summer. The upper courses typically have moderate to steep gradients, and often the channels are incised. The upper watercourses gather water and during flow periods are increasing in flow. Most of the watercourses have intermittent flows. Only streams in the highest ranges have perennial flows, and these are all small streams. In general, these mountain streams are formed into a system of tributaries that join to form a single master channel flowing in a v-shaped valley. Individual catchments vary in size and hydrologic character. As a general rule, the larger the area of the catchment at high elevation, the greater the potential for a larger volume of runoff and more sustained duration of flow in the watercourses. However, the aridity of the region is such that most watercourses, even in the high mountains, sustain only intermittent flow.

The middle segments of the watercourses are located where streams emerge onto the alluvial fan or pediment surfaces adjacent to the foot of the mountain ranges. Some fans have extended their heads up the canyon into the mountains, whereas others have their heads at the mountain front. Overall, the middle segments generally run approximately at right angles to the general alignment of the mountain range crest and valley axis. The middle segments of watercourses have gentle to moderate gradients, and there is a change from a gathering streamflow to a decreasing flow as the water seeps into the fan surface.

In general, the channel gradient drops gradually as the watercourse descends into the gentle slopes at the foot of the fan or pediment. The change in gradient and the reduced flow volume from seepage losses result in a drop in load. Eventually, the loss of flow and the drop of debris load blocking the channel are sufficient for the stream to change its course across the fan surface. Channels crossing a fan may split into more than one tributary. Seepage into the deep alluvium of a fan is rapid and evaporation rates are high, especially in the April – October period. As a result, most watercourses emerging from a mountain front carry insufficient volumes to reach the valley floor, and a recognizable channel disappears into the fan slope, or flow in the channel is insufficient to reach the dry lakebed in most years.

The third segment of the watercourses is the valley segment. Valley segments are universally of low gradient, and the watercourses flow in approximate parallel alignment to the axis of the valley. Stream channels become more circuitous as they flow across the gently inclined valley floor, forming meanders within an active floodplain. Many watercourses have such low gradient and high sediment loads that they form a braided channel (i.e., a complex system of intertwining channels). Often, a master channel is not distinguishable among the complex of braided channels. This is common for the larger watercourses that trend in alignment with the axes of the valleys. These streams discharge into local playa lakes formed at the lowest valley bottom area or, in some valleys, the streams continue on as tributaries of the Humboldt River. In general, runoff of many tributary streams in the study region to the Humboldt River occurs only during and shortly after large storms. At other times, the flows are insufficient to reach the river, although some underflow may continue for a while.

Flooding and Flash Flood Hazard

Seasonal flooding is characteristic of the region but largely confined to the watercourses and playa lakes. Flood hazards are extremely variable from year to year as a result of the variability in annual precipitation. In general, the aridity of the climate does not result in widespread, sizable floods. Snowmelt runoff in springtime (April through early June) produces the highest annual flows (BLM 1996). The coincidence of rainfall with the period of highest snowmelt runoff produces the greatest potential flood hazard. Winter and spring floods are reported in the Humboldt River Basin (BLM 1996; Eakin et al. 1966). Winter floods are generally high volume events of short duration when rain falls on snowpack. In general, flood hazards are low in summertime because of low precipitation, high evaporation, and localized rainfall distribution, which in combination produce small stream volumes. The exception to this is localized flash flood hazard.

Flash floods are a type of flood inundation but, because of the nature and severity of the event, represent a special hazard. They are unpredictable events, most commonly associated with summer rainstorms. Summertime precipitation in the region commonly comes in the form of thunderstorms, which typically are events of short duration and sometimes intense but localized rainfall. Large thunderstorms can result in flash floods. Most flash flood events are localized phenomena occurring during or shortly following cloudbursts, which are by nature localized events. The hazard of flash flood is prevalent in specific physiographic situations where the runoff from cloudbursts is quickly gathered in a watercourse. Flash floods can occur anywhere that intense rainfall occurs. However, it is cloudbursts in the upper watershed that are especially hazardous because the runoff is quickly shed on the steep slopes and concentrated into the main high gradient stream channels.

Flash floods are notably hazardous events in the middle and lower portions of a watercourse where the flows are concentrated but are related to the rapid runoff and concentrated streamflow in the upper portion of the watershed. The conceptual model conditions for a flash flood are represented by a physiographic situation in which there is a high mountain range drained by steep gradient tributary watercourses that join together in the mainstem at lower altitude, particularly where the lower mainstem has a confined channel (as is common where the stream emerges from the mountain face onto the alluvial fan/pediment). As a general rule, the larger the upper watershed in a mountain area and the steeper the gradients of its streams, the greater the potential for flash flood. The confined channel concentrates the flow and energy. The flood front rushes rapidly down channel, sometimes reported as a wall of water.

Often, people at risk are located at a stream channel in its lower reach and are unaware of the cloudburst and gathering flood in the upper watershed, which may be miles away from their location. The sudden appearance of the rapidly flowing flood front catches the victims unaware, sometimes resulting in loss of life and injury. Because flash floods carry large volumes of water and debris traveling at high speed, they have immense destructive potential. Capacity and competency to convey large rocks, great volumes of soil, and organic debris are high, and the concentrated energy of the stream is capable of considerable erosion. Flash floods are brief events that pass quickly after the cloudburst dissipates. They may leave a path of destruction, sediment, and debris. Additionally, as the flash flood stream emerges onto the gentler slopes of the alluvial fans, a rapid loss of stream capacity and competency occurs, and the stream quickly drops its debris load.

Groundwater

Springs are scarce but important features in the region because surface water supplies are limited for most of the year. Most springs are derived from groundwater flow in fractures, faults, and fault lines. The principal aquifers in bedrock in portions of the region are in carbonate rocks, siliceous rocks, and Tertiary volcanic rocks. Groundwater in the deep alluvium in the valleys and fans provides the most important source of water for wells in the study region. Shallow groundwater (e.g., near playas) is often saline, which limits its utility as a resource. Deep aquifers in the basins may produce high quality well water.

Although data are few, a substantial amount of the deep groundwater in the basins probably is derived from "fossil" waters dating back on the order of thousands of years when the water was trapped in the deep basin sediments. It is likely that the current arid climate of the region produces insufficient precipitation and infiltration to significantly recharge the deep groundwater. Additionally, the arrangements of geological materials (aquicludes, i.e., strata that retard flow to aquifers) or geologic structures limit recharge of deep-lying aquifers in some basins. Groundwater aquifers vary in each basin region. Underflow in the alluvium connects some basins, whereas other basins are closed hydrogeologic units. As noted, some springs are thermal.

The younger sediments that form alluvial fans in the region consist of coarse materials (boulders, cobbles, and gravel) and fine-grained materials (sand, silt, and clay) with variable discontinuous aquifer characteristics. In general, the groundwater follows the gradient from the elevated head of the fan toward the valley floor. Because of the contract in hydraulic conductivities between the coarse materials comprising the fan at its head and the finer materials at the toe at the valley floor, springs and seeps sometimes form along the toe of the fan.

Use of Water Resources

The entire project area is sparsely settled. Most of the region has widely scattered residences and small villages that depend on groundwater. Elko, Ely, and Eureka are the largest urban centers in the project area. These communities also rely on groundwater for domestic water supplies. Other water uses include mining, livestock, and a small amount of irrigated agriculture. Livestock watering ponds are supplied by wells, springs, and surface streams and are scattered throughout the area. There are no large reservoirs in the project area and only a few small impoundments in the vicinity of the route alternatives.

3.3.3 ENVIRONMENTAL CONSEQUENCES

This section presents the project-related actions for construction and long-term operation that may have significant impacts on the hydrologic environment, as well as significant hydrologic hazards that may affect the safety and operational reliability of the transmission line facilities. This section also includes mitigation measures to avoid or eliminate the impacts or reduce the effects to a less-than-significant level.

It is important to note that specific locations for transmission towers, material yards, and temporary spur roads have not yet been determined. Therefore, the assessment addresses potential impacts, some of which are likely to be avoided by discretionary site selection decisions by the project engineers and construction contractor. However, for purposes of a conservative analysis, no assumption is made about specific siting to avoid hazards or impacts.

SIGNIFICANCE CRITERIA

Project construction and operation activities would have a significant impact on water resources if they would:

- Result in discharges of contaminants and substantial amounts of sediment into receiving waters and watercourses or otherwise degrade water quality.
- Substantially alter the normal flow of a watercourse.
- Substantially alter the existing drainage pattern and runoff of the site or area.
- Disrupt the normal flow of springs and water wells.
- Result in failure of the proposed facilities due to flooding in an existing stream channel and/or a flash flood event.

The preceding impact criteria require further definition for purposes of the analysis. In general, impacts can be rated as high, medium, or low, indicating the relative severity of the hazard or effect. Impacts rated high or medium are regarded as potentially significant impacts and require mitigation to reduce the impact to a less-than-significant level.

Stream Crossings and Potential Impact Zones

Construction activity and placement of transmission towers or other facilities in the active channel of a watercourse, standing water body, flood plain, or wetland would be considered to have a high potential for a significant impact before mitigation. Disturbances within approximately 20 feet of the edge of a streambank would also be considered potentially high impact zones. Construction in this zone would be considered a significant impact and mitigation measures would be required to prevent significant impact to water resources. Watercourses are identified on USGS 1:24,000 topographic quadrangles as blue lines and blue shading. These locations are deemed immediately susceptible to impacts of contaminant discharge and alteration of normal flows by proposed structures or construction effects.

Construction activities and placement of transmission towers or other facilities within 100 feet of the active channel of a mapped watercourse (blue-line on USGS 1:24,000 topographic quadrangles), standing water body, or wetland would be considered having moderate potential for significant impact before mitigation, although less degree of hazard than the zone within 20 feet of a watercourse, and generally would be a less-than-significant hazard. This is a conservatively defined area of potential impact. It is intended to encompass a variety of potential situations for impact, especially slope, and the system of tributary channels carrying ephemeral streams that flow directly into a mapped watercourse. Mitigation would depend on the individual site conditions

Construction activities and placement of transmission towers or other facilities beyond 100 feet of the active channel of a mapped watercourse, standing water body, or wetland are considered to have low potential for impact.

Springs and Water Wells

Construction activities and placement of transmission towers or other facilities within 500 feet of a spring or seep would be considered a high impact before mitigation. Springs are identified on USGS 1:24,000 topographic quadrangles by blue symbols. These locations are deemed immediately susceptible to impacts of contaminant discharge and disruption of normal flows by proposed structures or construction effects. The 500-foot study corridor was established for purposes of this EIS analysis based on the assumption that 500 feet reasonably provides adequate distance from a construction zone: 1) to prevent damage to the well/spring by machinery and vehicles, and 2) to ensure that other activities do not result in impacts on the area immediately surrounding a spring or shallow well field activities (e.g., soil compaction, silt generation, cuts opening of a new spring that might divert waters, etc).

Construction activities and placement of transmission towers or other facilities within 0.25 mile of a spring or water well are considered a low to medium potential for significant impact before mitigation, depending on the local topography and geological conditions.

Construction activities and placement of transmission towers or other facilities beyond 0.25 mile of a spring or water well are considered to have low potential for significant impact or no impact.

Flood Inundation

Placement of transmission towers or other facilities within the active channel or floodplain of a watercourse wider than 3,500 feet is considered a high potential for significant impact before mitigation. Areas of braided watercourses are considered as a unit (rather than treating each channel as separate watercourse). Watercourses and floodplains are identified on USGS 1:24,000 topographic quadrangles by contours indicating the approximate banks of the general floodplain.[2]

Depending on local conditions, placement of transmission towers or other facilities within the active channel or floodplain of a watercourse wider than 1,000 feet but less than 3,500 feet is considered a moderate potential for significant impact before mitigation. Areas of braided watercourses are considered as a unit (rather than treating each channel as separate watercourse). These impact distance criteria are based on the reasonable distance between transmission towers with which the project engineers can locate the facilities. As a general rule, 1,700 feet is the approximate longest distance for most spans of the proposed project. Thus, a watercourse that is 1,000 feet wide usually can be spanned by the transmission line with towers located outside the flood inundation zone, and there is approximately 700 feet leeway with which to work (considering the positioning of adjacent towers). If the flood inundation zone of a watercourse is wide, then it may be necessary to place one or more transmission towers in the flood zone. Given the working assumption on flexibility in span between transmission towers, 3,500 feet was chosen as a reasonable distance for the impact criterion because the crossing of any watercourse of that width would likely need at least one transmission tower sited within the flood zone.

Placement of transmission towers or other facilities within the active channel or floodplain of a watercourse less than 1,000 feet wide is considered a less-than-significant impact because the flood hazard zone could be spanned with normal construction. Areas of braided watercourses are considered as a unit (rather than treating each channel as separate watercourse).

Flash Flood Hazard

Placement of transmission towers or other facilities within the active channel or floodplain of a watercourse, the catchment of which has physiographic characteristics generally indicative of conditions conducive to flash flood events, is considered a high potential for significant impact before mitigation. Watercourses and catchments potentially conducive to flash floods are identified on USGS 1:24,000 topographic quadrangles.[3]

The hazard of flash flood is prevalent in specific physiographic situations. Flash flood is a type of flood inundation but, because of the nature of the nature and severity of the event, represents a special hazard. Because flash floods are localized phenomena occurring during summertime cloudbursts, few data are available to map flash flood hazard. An interpretation of flash flood hazard has been made based on a qualitative assessment of the physiographic situation appropriate to flash flood conditions, as follows. Flash floods are localized events in the middle or lower portion of a watercourse but related to runoff

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[2] Note 1: The topographic maps vary in the age since their most recent updates, and changes in the channel configurations may have occurred in the interim; therefore, the locations of the floodplains are approximate. Nonetheless, this is generally suitable for purposes of the impact assessment.

Note 2: The width of 3,500 feet was selected because it is approximately twice the upper span length between towers; a floodplain of this width would necessitate at least one tower being placed in the flood zone.

Note 3: Flood inundation mostly only interrupts normal maintenance; the hazard is primarily related to the erosion and scour associated with floods and because towers can block debris entrained in flood waters.

Note 4: FEMA regards the entire surface of an alluvial fan as a 100-year flood zone because individual watercourses migrate across the surface of the fan, with changes in channel locations sometimes occurring abruptly. However, for purposes of this analysis, an alluvial fan surface is not considered a floodplain because the inundation in storm events would remain localized. Impacts related to stream courses are covered in previous criteria.

[3] The topographic maps vary in the age since their most recent updates, and changes in the channel configurations may have occurred in the interim; therefore, the locations of the floodplains are approximate. Nonetheless, this is generally suitable for purposes of the impact assessment.

events in the upper portion of the watershed. The larger the upper watershed and the steeper the stream gradients, the greater the potential for flash flood. Thus, to have a flash flood hazard, the following operational criteria were regarded to be necessary to qualify as conditions conducive to creating flash flood hazard conditions: (1) high degree of relief in the watershed, generally at least over 2,000 vertical feet; (2) steep gradient of the stream system; (3) more than three tributary streams to the mainstem draining an area totaling at least 3 square miles; and (4) a relatively confined channel for the lower stem. While flash floods can occur in any area where intense rainfall occurs over a local area (whether these conditions are present or not), there is no way to distinguish between the relative hazards other than presence of a stream channel. Because this is a qualitative intuitive evaluation, the criteria are general and presented in terms of the relative presence of these conditions.

Placement of transmission towers or other facilities within the active channel or floodplain of a watercourse, the catchment of which has some of the physiographic characteristics generally indicative of conducive to flash flood events, is considered a moderate potential for significant impact before mitigation. Watercourses and catchments potentially conducive to flash floods are identified on USGS 1:24,000 topographic quadrangles and soil surveys provide some indication of the hazard.

Placement of transmission towers or other facilities within the active channel or floodplain of a watercourse, the catchment of which has few of the physiographic characteristics generally indicative of being conducive to flash flood events or for which soil surveys indicate a similar hazard, is considered a less-than-significant impact before mitigation.

ENVIRONMENTAL IMPACTS – COMPARISON OF ALTERNATIVES

Impacts Common to all Route Alternatives

The following presents the impacts and associated mitigation measures that are common to all route alternatives of the project.

The proposed transmission line would cross many drainage features. Table 3.3-2 identifies the number of potential watercourse crossings mapped as blue-line symbols on USGS topographic maps.

❑ ***Impact Water-1: Potential Spills or Discharges During Construction***

Project construction activities could potentially result in discharges of contaminants into receiving waters, watercourses, wetlands, and stock watering ponds, degrading their water quality. Hazardous and toxic substances needed for construction include fuels, motor oil, coolants, antifreeze, solvents, battery acid, brake fluid, gasoline additives such as MTBE, paint, and other substances used by vehicles, motorized machinery, and heavy equipment. Additionally, explosives may be used in some areas. Accidental spills could cause contaminants to be transported into waterways at the time of the spill, or in runoff during subsequent rain storms or by snow melt. The impact is potentially significant and mitigation is required.

❑ ***Mitigation Measure Water-1a***

To the extent practicable, SPPC would minimize the use of hazardous and toxic substances and minimize the need for disposal of hazardous and toxic wastes. By reducing the use of hazardous and toxic substances, the potential to result in spills would be reduced commensurately. SPPC's construction contractor would collect and recycle hazardous materials and wastes that can be readily recycled (e.g., motor oil and lubricants). Hazardous substances or wastes would be removed from construction sites following the construction period.

TABLE 3.3-2: NUMBER OF WATERCOURSE CROSSINGS, SPRINGS, OR WATER WELLS WITHIN 0.25 MILE OF ROUTE SEGMENTS

Segment or Re-route	Number of Crossings of USGS Blue-line Watercourses	Springs within 500 feet	Wells within 500 feet	Springs and Wells within 0.25 Mile
A	11	2	1	2
B	52	2	1	3
C	58	-	-	3
D	26	-	-	-
E	103	-	1	3
F	24	-	-	3
G	45	-	1	3
H	30	-	-	2
I	31	-	-	6
J	76	-	1	2
K	5	-	-	1
L	12	-	-	-

Source: EDAW 2000 (from USGS 1:24,000 Topographic Quadrangles)

❑ ***Mitigation Measure Water-1b***

SPPC would prepare a Hazardous Materials Management and Spill Prevention Plan (HMMSPP) for the construction and long-term operation of the proposed facilities and be responsible for its implementation by the construction contractor. The HMMSPP would identify hazardous materials proposed for use in the construction and operation of the facilities. The HMMSPP would include provisions to prevent discharges of hazardous and toxic materials into water bodies, watercourses, wetlands, and livestock watering ponds. The HMMSPP would include specific measures to contain hazardous and toxic substances used in storage, fueling, vehicle/machinery servicing, and disposal areas. The HMMSP would identify labeling and storage requirements. The HMMSPP would identify containerization requirements for hazardous and toxic substances used during construction and operation of the project. It would identify planned transportation routes and the active area of operation of machinery, equipment, and vehicles. The HMMSPP would identify spill control and countermeasures including notification and reporting requirements immediately following a spill and in the period of clean-up.

The HMMSPP would specify the nature of any hazardous waste materials generated during construction and operation of the project, their disposal, and the disposal of any containers containing hazardous substances, as well as waste oil filters. The HMMSPP would identify a program of worker education and training, as well as spill response training. Best management practices and controls for spill prevention and countermeasures would be employed for HMMSP components. SPPC environmental monitors would submit a report in conjunction with other project environmental reports, detailing how compliance with the HMMSPP occurred during construction. The HMMSPP would indicate how SPPC would ensure that its contractors meet the requirements of the HMMSPP.

❑ ***Impact Water-2: Erosion and Sediment from Construction***

Project construction activities could potentially result in discharges of sediments into receiving waters, watercourses, wetlands, and livestock watering ponds, creating turbidity and degrading water quality. During construction, some soils would be denuded of vegetation cover, exposing them to potential erosion and discharge into watercourses. Grading activities and road blading could result in soils being sidecast or bulldozed into piles subject to wind and water erosion and subsequent discharge into watercourses. The hazard generally would be greater for grading activities on areas with higher gradient. The impact could potentially violate provisions of the federal Clean Water Act and could adversely affect biotic resources. The impact is potentially significant and mitigation would be required.

- ❑ ***Mitigation Measure Water-2a***

To the extent practicable, SPPC would minimize surface-disturbing activities within the channel of watercourses. This may entail relocating facilities and activities to avoid the necessity of filling, cutting, or otherwise altering the channel of watercourses.

- ❑ ***Mitigation Measure Water-2b***

If a stream channel cannot be avoided, SPPC would require its contractors to either avoid construction activities involving soil disturbance in a watercourse during periods of flow or, alternatively, "in the dry" construction measures would be used (e.g., provide a temporary or permanent diversion channel and/or install a culvert with a design capacity similar to the unaltered channel). If a temporary diversion channel is constructed, following completion of construction activities, the channel would be re-graded to stable contours, the soils would be stabilized and re-seeded with an approved seed mix, or re-vegetated to ensure the long-term stability of the channel and to prevent erosion. Temporary fencing would be installed to prevent livestock from entering the disturbed area until it has a stabilized vegetation cover (however, access to water would be provided for livestock at places, see Mitigation Measure Range-1). SPPC would include measures in its COM Plan to address erosion and sediment discharge into stream courses.

- ❑ ***Mitigation Measure Water-2c***

If soil or other debris is placed in a channel or piled by bulldozers and grading equipment on the bank during construction, the soil would be removed from the channel or bank and appropriately spread and stabilized to prevent its entrainment in discharge events. If a temporary stream diversion berm is constructed, following completion of construction activities, the berm would be removed and the soil appropriately disposed and stabilized to prevent erosion.

- ❑ ***Mitigation Measure Water-2d***

SPPC would prepare a Stream Crossing Plan (SCP) and ensure compliance of the construction contractor with it. The SCP would address measures to protect water quality, flow conditions in the channels, and associated biological and cultural resources in the area of potential effect. The SCP would provide specific measures to prevent soil erosion and sediment deposition in all construction disturbance areas within 100 feet horizontally of a watercourse (especially any flowing watercourse that is greater than approximately 10 feet wide and 3 feet deep). For small watercourses and those with no flow in the construction period, generic mitigation measures in the SCP will be applied. Such measures would normally include best management practices for construction to control erosion and silt deposition and stabilize the site after completion of construction.

- ❑ ***Mitigation Measure Water-2e***

A Soil Conservation and Erosion Control Plan (SCECP) would be required and would include measures to prevent sediment discharges into water bodies and watercourses. The SCECP would demonstrate the plan for compliance with the BLM's Right-of-Way Guide Stipulations, BLM Handbook H-2801-1, Chapter II C.6.a to e and State of Nevada Environmental Commissions Handbook of Best Management Practices.

❑ ***Impact Water-3: Potential Watercourse Obstruction***

While SPPC would locate transmission towers to avoid watercourses to the extent feasible, it may not be possible to span every watercourse. Thus, project construction activities and the placement of transmission towers in a watercourse could potentially result in an obstruction of or alteration of flows. The impact would be significant. The obstruction of a watercourse could reduce the conveyance capacity of the active channel, result in erosion and undermine the channel bank stability, and/or or result in a shift in the active channel location with associated environmental effects and property damage. Additionally, stream scour could undercut the support structure in the watercourse and undermine the stability of the tower. Mitigation would be required.

❑ ***Mitigation Measure Water-3a***

To the extent practicable, SPPC would attempt to avoid the placement of any transmission tower within the channel of a watercourse greater than approximately 20 feet in width and more than 5 feet deep. SPPC would set back all towers to a position that would not increase the potential to undermine streambank stability or pose a hazard to the tower foundation.

❑ ***Mitigation Measure Water-3b***

If placement of a transmission tower or road is unavoidable within a stream channel, SPPC would require its contractor to construct a permanent diversion structure or culvert sufficient to carry the stream's normal conveyance capacity at that site. The structure would be constructed in such a way as to armor the diversion from erosion at the point of diversion and at the point where it re-joins the channel. Culverts would be sized to convey the flows of the natural channel. The culvert would be constructed to prevent erosion at its intake and outlet end. Culverts and diversion structures would be inspected and cleared of debris and sediment to maintain their conveyance capacity. These measures should be included in the SCP. In the event that the structure would have a minimal reduction on capacity of a large channel, as determined by calculations of the project engineer, this mitigation measure may not be required.

❑ ***Mitigation Measure Water-3c***

If placement of a transmission tower or road is unavoidable within a stream channel, and a permanent diversion structure or culvert is deemed impractical by the project engineer, the foundation of the structure would be armored to protect it from scour by the watercourse. The structure or road would be armored with rock, such as river rock or gabions, or cement/concrete in the channel. The tower footings and road surface structures would be inspected regularly and cleared of debris. These measures should be included in the SCP.

❑ ***Mitigation Measure Water-3d***

Existing watercourse crossings would be used to the maximum extent possible. If construction requires working within the active channel of a flowing watercourse, the area of soil disturbance activity or crossing would be held to the absolute minimum. Blading would not be used to facilitate the crossing of a watercourse carrying a discernible flow of water. A temporary bridge would be placed over the channel, a temporary diversion and/or culvert would be constructed, or for small watercourses a swamp mat would be placed in the channel, as appropriate for the channel and flow conditions at the time. Straw bales or silt fences would be placed in small watercourses to trap sediment from construction. Following construction, the bales and silt fences would be removed.

❑ ***Impact Water-4: Soil Compaction and Increased Runoff***

Project construction activities and the construction of substations could result in a change in the surface permeability of the soil. Compaction by heavy equipment and vehicles at construction sites could reduce the ability of the soil to absorb rainfall and snowmelt. That effect, in turn, could result in increased runoff and incremental effects on flood flows. Impermeable surfaces at substation sites could have similar impacts. The impact is potentially significant and mitigation would be required.

- ❑ ***Mitigation Measure Water-4***

SPPC would require its contractor to carry out a program of soil restoration at all construction sites. Soil should be bladed or otherwise broken up to reduce compaction. The soil surface then should be imprinted (micro-textured) to help capture rainfall, promote soil aeration, reduce the potential for rill erosion, and encourage natural revegetation. On slopes with over 5% gradient, seeding and vegetative restoration would be required. SPPC would repair any erosion created by runoff from project facilities, especially roads and substations (see Mitigation Measures Soil-2 and Soil-4).

- ❑ ***Impact Water-5: Potential Damage to Springs and Wells***

Project construction activities could potentially affect the flow of springs and the operation of water wells, particularly if they draw on shallow groundwater. Blasting, heavy machinery, and grading activities have the potential to damage springs and wells, affecting their flow and production rates. Accidental spills of hazardous substances could result in contamination. Dewatering, if required for some construction sites, could adversely affect shallow groundwater conditions. The impact is potentially significant and mitigation would be required.

- ❑ ***Mitigation Measure Water-5a***

Prior to construction, SPPC would conduct a survey of the route to identify all springs and water wells within 1,000 feet (horizontal) of the construction zone. Depth, flow conditions, and hydrogeologic relationships would be identified. Additionally, the spring survey would include an assessment by a qualified biologist to determine if any sensitive endemic species are present at the spring or in the immediate vicinity that are dependent on the spring. The construction contractor would avoid carrying out soil disturbance activities within 100 feet (horizontal) of any spring or well without implementation of proper BMPs. Blasting would be prohibited within 500 feet of a spring or well, and only size-limited blasting would be allowed within 1,000 feet, unless it can be demonstrated in a report prepared by a qualified hydrogeologist that no effect on the well or springs can be reasonably expected to occur or that the effects can be effectively mitigated. SPPC would repair any damage to a spring or well resulting from construction activities.

- ❑ ***Mitigation Measure Water-5b***

Construction activity in the vicinity of springs and wells would include special precautions to prevent spills of contaminants, discharges of foreign materials, and direct or indirect sediment discharges at and near the spring or well site. No hazardous substances would be stored or handled at a spring or well site. Heavy equipment/machinery would not be operated within 100 feet of a shallow well or spring without implementation of proper BMPs.

- ❑ ***Mitigation Measure Water-5c***

Construction activity requiring dewatering would be planned to result in minimal effects on springs and wells. This may include employing rapid construction techniques for structural foundation excavations requiring dewatering to minimize effects of the cone of depression in the water table. Flow or water level changes in nearby wells or springs would be monitored and supervised by the construction monitor. If loss of supply to the well or spring owner would result in temporary or permanent hardship or economic loss to the owner, SPPC's contractor would be required to provide an alternative water supply.

- ***Impact Water-6: Flash Flood Hazard to Towers***

  Transmission towers could be constructed in areas subject to flash flood hazards. Because of the sometimes extreme erosive power of flash floods, severe damage to towers could result, potentially including tipping. The impact is potentially significant. As flash flood events cannot be predicted effectively, the impact cannot be wholly eliminated. However, mitigation measures can be applied to reduce the hazard to within an acceptable level of risk.

- ***Mitigation Measure Water-6a***

  In general, avoid placement of towers within or in proximity to an active channel of a watercourse on the upper part of an alluvial fan, particularly where it emerges at the canyon mouth at the mountain front. Watercourses with a sizable catchment in the mountains may be especially prone to flash floods. Tower placement in such potential flash flood hazard areas would be based on the decision of the project engineer or an engineering geologist. Additionally, it is recommended that SPPC conduct interviews with local officials and residents to obtain anecdotal information about past flash flood events to locate specific historic hazard areas.

- ***Mitigation Measure Water-6b***

  Where placement of a tower near the head of an alluvial fan near the canyon mouth is unavoidable, a geotechnical engineer should be retained to design appropriate protective measures for the towers at risk. For example, this might include deeper footings and extra reinforcement at the base of the tower, construction of earthen berms to deflect water around the tower, constructing diversion channels, modification of the natural channel of the watercourse, or other measures as deemed appropriate for the site by the project engineer.

Access Road Impacts

Centerline clearing, spur roads, and improvements to existing access roads could adversely affect hydrological conditions, runoff, and water quality. The impacts would be similar to those described for Impacts Common to All Route Alternatives. The impacts could be direct (e.g., filling of a watercourse without providing appropriate drainage, spills of contaminants into watercourses, and direct placement of sediments in the channel). The impacts also could be indirect through discharges of sediment and contaminants that find their way into the watercourse and are transported downstream. Depending on road location, springs, wells, and ponds also may be affected by blasting or contamination. The following is a generic assessment of the impacts of access roads and related mitigation measures. The COM Plan will address individual access roads.

Mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives. Best management practices for construction would be required.

- ***Impact Water-7: Access Road Impacts***

  Clearing of the centerline travel route and temporary spur roads within the 500-foot study corridor, as well as improvements to some existing access roads outside of the 500-foot corridor, could result in the creation of new erosion gullies or expansion and accelerated erosion of existing erosion features. In general, the greater the slope, the more potential there is for surface runoff to result in erosion and the attendant deposition of sediment in watercourses. The impact is potentially significant and mitigation would be required.

- ***Mitigation Measure Water-7a***

  The construction contractor would limit access road clearing and improvements to the minimum required. In some areas, construction using helicopters may be the environmentally least damaging approach.

❑ ***Mitigation Measure Water-7b***

The centerline travel route and temporary spur roads would not follow dry washes or watercourses, and all watercourse crossings would be selected to require minimum disturbance to the channel and banks.

❑ ***Mitigation Measure Water-7c***

To the extent possible, the construction contractor would schedule road improvement activities during dry periods to reduce erosion of newly graded surfaces. Mitigation Measure Soil-1 also addresses this issue.

❑ ***Mitigation Measure Water-7d***

SPPC would include road construction and widening within the Soil Conservation and Erosion Control section of the COM Plan. A variety of drainage control structures would be used to direct surface runoff away from the road surface to prevent rill and rut development and to control runoff and sediment discharges. The road improvements would include culverts, water bars at appropriate intervals related to slope and geologic material, ditches, and appropriate grades and inclination.

❑ ***Mitigation Measure Water-7e***

SPPC's construction contractor would not sidecast spoils from road improvements into or in proximity to canyons, sidewalls, streams, gullies, drainage ditches, or wetlands. Where soil placement is necessary in watercourse, the material will be placed and engineered to ensure its long-term stability and protection from erosion. Spoil piles would be removed immediately after road reclamation activities, in accordance with the Reclamation Plan, are complete. All spoil disposal sites would be located, graded, compacted, seeded, and left in manner that is well-drained and protected from erosion. Spoil disposal sites should not be located within or in the immediate vicinity of watercourses. All off-site spoils disposal should be approved by the appropriate local BLM Field Office or the county with jurisdiction.

Segment A

Segment A, shared by all route alternatives, would include the crossing of the Humboldt River, 3 low gradient intermittent watercourses in Boulder Valley, and 10 small or medium gradient watercourses identified as blue-line watercourses on USGS topographic quadrangles. The segment mostly would traverse valley and fan areas along the eastern flank of the Shoshone Range with low to gentle slope. Two springs are located within 500 feet of the alignment and a number of wells would be located close to the segment. The well at the Dunphy Ranch is close to the proposed route and could be subject to potentially significant impacts.

❑ ***Impact Water-8: Humboldt River Crossing Inundation Hazard***

The crossing of the Humboldt River floodplain presents the most significant flood inundation hazard of any of the segments. While the width of the Humboldt River floodplain is broad, SPPC believes it would be able to span the entire channel because one side of the channel (next to the highway) is relatively high. However, it may be difficult to span a distance of more than 1,500 feet. Because it appears that the span is possible, the impact is considered less-than-significant and additional mitigation is not required.

❑ ***Impact Water-9: Potential Discharges to Humboldt River***

The crossing of the Humboldt River floodplain may entail disturbance of the soils and direct discharges into the river. The river is the single-most significant water feature in the region, and impacts to its water quality would constitute a significant impact. Similarly, the crossing of the

Rose Canal poses similar hazards of contamination of water during construction. Mitigation is required. Mitigation measures for Impacts Common to All Route Alternatives would be applied to the crossing of the Humboldt River.

❑ ***Mitigation Measure Water-9***

SPPC would include a specific section on the crossing of the Humboldt River within its HMMSPP. The section would address in detail measures to site facilities, construct them with minimal disturbance and hazards to the river, and site clean-up and restoration following construction. Because well protection is important, Mitigation Measures Water 1a – 1b and Water 6a – 6b should be given special attention in the COM Plan.

Segment J

Segment J, shared by all of the route alternatives, would cross Jakes Valley, Smith Valley, Steptoe Valley, and the upper portion of Long Valley, all of which have internal drainage. The segment would make 76 crossings of channels shown as USGS blue-line watercourses. Of the total crossings, 23 are low gradient intermittent watercourses, 47 are gentle gradient watercourses, 4 are medium, and 2 are high gradient watercourses. These streams drain the slopes of the White Pine Mountains, Butte Mountains, and Egan Range. The segment would traverse portions of the Butte Mountains and Egan Range, where some moderate gradient watercourses are located. Flood hazard is generally low.

Segment J would pass within 0.25 mile of Sammy Springs in the Butte Mountains and a stock pond. Springs and wetlands located near Hercules Gap in Smith Valley are also a little beyond 0.25 mile from the segment. Contamination from construction would be a potentially significant impact. This is a sensitive resource area, and Mitigation Measures Water 1a –1b and Water 6a – 6b should be given special attention in the COM Plan. Hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Alternative-Specific Impacts

The following discussion is focused on the impacts associated with each of the five route alternatives, discussed by segment where appropriate. To avoid repetition of text, the discussion refers to the nature of conditions that create impacts and hazards that are similar to the general impacts for the project as a whole. The discussion identifies any effects unique to that route alternative or segment which may differ in kind or intensity from those presented in the previous impact discussion. Because each of the route alternatives differ by one or more segments, these alternative-specific impacts are best discussed in terms of their differentiating segments.

Note that detailed segment-by-segment data tables were prepared for the project; these tables summarize, by milepost, the elevation, topography, hydrologic features, and potential hazards for each segment. These segment-specific data are not necessary for purposes of NEPA analysis. However, they have been compiled in a separate Water Resources Technical Memorandum (EDAW, 2001).

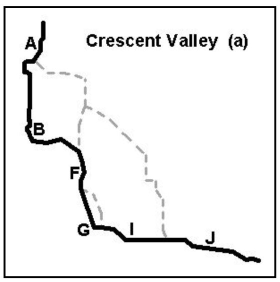
For comparative purposes, the number of USGS blue-line watercourse crossings, springs within 500 feet, wells within 500 feet, and springs and wells within 0.25 mile are summarized by route alternative in Table 3.3-3.

TABLE 3.3-3: NUMBER OF WATERCOURSE CROSSINGS, SPRINGS, OR WATER WELLS WITHIN 0.25 MILE OF ROUTE ALTERNATIVES

Segment or Re-route	Number of Crossings of USGS Blue-line Watercourse	Springs within 500 feet	Wells within 500 feet	Springs and Wells within 0.25 Mile
Crescent Valley (a)	239	4*	4*	18
Crescent Valley (b)	224	4*	4*	18
Pine Valley (a)	271*	2	3	19*
Pine Valley (b)	256	2	3	18
Buck Mountain	179	2	3	10

**represents the highest number of hydrological features associated with a route alternative*

Crescent Valley (a) Route Alternative



The Crescent Valley (a) route alternative is comprised of Segments A, B, F, G, I, and J. In addition to the impacts common to all route alternatives discussed above (i.e., Impact Water -1 through 9), specific impacts for the Crescent Valley (a) route alternative are listed below by their general location (segment).

Segment B

Segment B, shared by both the Crescent Valley route alternatives, is located in Crescent Valley, Denay Valley, and Garden Valley, all of which all drain into the Humboldt River. A section of Segment B crosses part of Grass Valley, which has internal drainage. There would be 52 crossings of watercourses in this segment including 17 low gradient, 9 gentle gradient, and 38 medium gradient channels. None of the watercourses are of substantial size. Horse Creek, Pine Creek, Denay Creek, and Henderson Creek in Pine Valley are the larger watercourses, and the crossings would occur in the lower reaches with gentle gradients. Flood inundation hazard is present in those four areas. Flash flood hazard may potentially exist at the crossing of the watercourse below Mills Canyon in the Cortez Mountains.

The watercourses crossed by this segment are predominantly low to gentle gradient valley floor and alluvial fan streams. A small portion of the segment would cross the Cortez Mountains and Canyon, where slopes and watercourses have moderate to steep gradients. Potential impacts of stream crossings and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

The original alignment of Segment B (i.e., the portion that would be replaced by the L re-route shown in Figure ES-1) would pass close to thermal springs in Whirlwind Valley. At least three of the mapped springs are within the 500-foot construction corridor, and several more are within 800 feet. However, field inspection did not encounter flow in the springs. Geothermal energy development at the Geysers may have affected these springs such that flows no longer occur. This is a sensitive groundwater resource area. A spring is also located within 500 feet of the alignment northwesterly of Cortez. Mitigation Measures Water 1a –1b and Water 6a – 6b should be given special attention in the COM Plan. The segment also would pass within 500 feet of a well westerly of Crescent City.

K Re-route (along Segment B)

Table 3.3-2 summarizes hydrologic features and hazards associated with the K re-route. This is a potential option for re-routing a portion of Segment B around an area that contains sensitive resources (see Figure ES-1).

The K re-route would cross watercourses in the Toiyabe Range near Cortez Canyon. The K re-route would cross 5 USGS blue-line watercourses that are medium to steep gradient features draining the slopes of the mountains. Flood hazard is generally low.

The re-route would pass within ½ mile of springs in Copper Canyon that are downgradient of the crossing site. Contamination from construction would be a potentially significant impact. This is a sensitive resource area, and Mitigation Measures Water 1a–1b and Water 6a – 6b should be given special attention in the COM Plan. Under the original alignment for Segment B in this area, the Copper Canyon Springs would be more distant from the disturbance area than for this re-route. However, the proposed route would place the transmission line within ¼ mile of a spring in Cortez Canyon; therefore, the potential for impact would be somewhat less. Hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

L Re-route (along Segment B)

Table 3.3-2 summarizes hydrologic features and hazards associated with the L re-route. This is a potential option for re-routing a portion of Segment B around an area that contains sensitive resources.

The L re-route would cross 12 USGS blue-line watercourses that are small, medium gradient features draining the slopes of the Shoshone Range. Flood hazard is generally low.

The re-route would not pass within ¼ mile of any mapped springs or wells. Selection of the re-route would avoid sensitive springs in Whirlwind Valley that are close to the original alignment of Segment B. Hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Segment F

Segment F, shared by the Crescent Valley and Pine Valley route alternatives, would be located in Garden Valley, which is drained by Henderson Creek. The area forms the headwaters of Henderson Creek, a tributary of the Humboldt River. Approximately 24 USGS blue-line watercourses would be crossed by Segment F. These are 6 low gradient, 15 gentle gradient, and 3 medium gradient watercourses that drain the eastern flank of the Roberts Mountains. Henderson Creek and Vinini Creek are the larger watercourses. The area has relatively low flood inundation hazard because the area is in the upper reach of the catchment.

The segment would pass within 0.25 mile of one well and three springs, some of which are immediately downstream of the proposed corridor. Therefore, a potentially significant impact on water quality and flow conditions could occur. Special care should be taken during construction to implement mitigation measures Water 6A and 6B in those spring and well areas. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Segment G

Segment G, part of both the Crescent Valley (a) and Pine Valley (b) route alternatives, would cross the upper area of Kobeh Valley, which has internal drainage or is drained via Slough Creek to the enclosed drainage of Diamond Valley. The segment would cross 45 USGS blue-line watercourses, of which one is a low gradient watercourse. Slough Creek and remainder are medium gradient features draining the western slopes of the Whistler Range and the northern slopes of the Mountain Boy Range (e.g., Yahoo

Creek). The watercourses are entirely located on fan and/or pediment slopes. Flood hazards are generally not great, probably most significant in the floodplain of Slough Creek.

Segment G would pass within 0.25 mile of a spring and several ponds and two wells. Contamination from construction would be a potentially significant impact. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Segment I

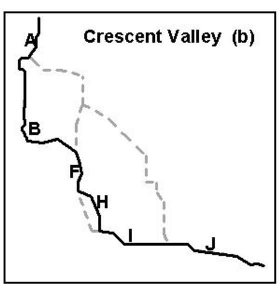
Segment I, part of all route alternatives except Buck Mountain, would cross the upper portion of Diamond Valley and Newark Valley, both of which have internal drainage. The segment would cross 31 USGS blue-line watercourses. Of that total, ten are low gradient features (including one braided channel), 12 gentle gradient watercourses, and 9 medium gradient watercourses. These watercourses drain the slopes of the Diamond Mountains and White Pine Mountains. The segment would traverse the Diamond Mountains, where some steep gradient watercourses are located. Flood hazard is generally low.

Segment I would pass within 500 feet of Simpson Springs (a locus of 7 springs) and Pinto Creek Spring. The segment also would pass within ¼ mile of a number of Muchacho Springs. It would pass within 500 feet of one well and a livestock watering tank. Contamination from construction would be a potentially significant impact. This is a sensitive resource area, and Mitigation Measures Water 1a – 1b and Water 6a – 6b should be given special attention in the COM Plan. The segment also passes within 0.5 to 4 miles of many springs. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Summary – Crescent Valley (a)

Crescent Valley (a) would cross 239 USGS blue-line watercourses, 4 springs within 500 feet, 4 wells within 500 feet, and 18 springs within 0.25 mile. The number of watercourse crossings is more than that of the Buck Mountain Route Alternative but less than that of the Pine Valley Routes. There is not a substantial difference with regard to the numbers of springs and wells between the alternatives. The most significant aspect of the route is the crossing of the Humboldt River and the hot springs area in Whirlwind Valley. Adverse impacts can be reduced to a less-than-significant level by implementing Mitigation Measure Water-1 through -9.

Crescent Valley (b) Route Alternative



The Crescent Valley (b) route alternative is comprised of Segments A, B, F, H, I, and J. It follows a nearly identical alignment with the Crescent Valley (a) route, except that it uses Segment H rather than Segment G, traversing the east side of Whistler Mountain rather than the west. The Crescent Valley (b) route shares the impacts common to all route alternatives (i.e., Impact Water-1 through -9) and the impacts associated with Crescent Valley (a) route, except it would avoid any impacts in Segment G, described above. Segment H is described below.

Segment H

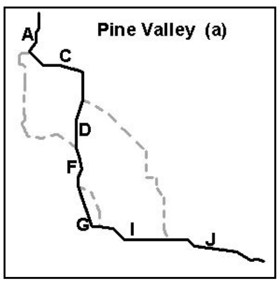
Segment H, part of both the Crescent Valley (a) and Pine Valley (b) route alternatives, would cross the upper portion of Diamond Valley, which has internal drainage. The segment would cross 30 USGS blue-line watercourses, of which 4 are low gradient, 21 are gentle gradient, and 5 are medium gradient. These watercourses drain the eastern slopes of Whistler Mountain and the northern slopes of the Mountain Boy Range. The watercourses are entirely located on fan and/or pediment slopes. Flood hazard is greatest in the floodplain of Slough Creek.

Segment H would pass within 0.25 mile of two wells, and contamination from construction would be a potentially significant impact. No springs are proximate to the segment. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Summary – Crescent Valley (b)

Crescent Valley (b) would cross 241 USGS blue-line watercourses, 12 springs within 500 feet, 5 wells within 500 feet, and 11 springs within 0.25 mile. The number of watercourse crossings is more than that of the Buck Mountain Route Alternative but less than that of the Pine Valley Routes. Crescent Valley (b) crosses fewer blue-line watercourses than Crescent Valley (a). There is not a substantial difference with regard to the numbers of springs and wells between the alternatives. Like Crescent Valley (a), the most significant aspect of the route is the crossing of the Humboldt River and a hot springs area in Whirlwind Valley. Potential adverse impacts can be reduced to a less-than-significant level by implementing Mitigation Measures Water-1 through -9.

Pine Valley (a) Route Alternative



The Pine Valley (a) route alternative is comprised of Segments A, C, D, F, G, I, and J. It follows a similar alignment to the Crescent Valley (a) route, except that it uses Segments C and D instead of Segment B. In addition to the Impacts Common to All Route Alternatives described previously (i.e., Impacts Water-1 through -9), the Pine Valley (a) route would involve impacts associated with Segments C and D, as addressed below.

Segment C

Segment C, part of the Pine Valley and Buck Mountain route alternatives, would be located in Whirlwind Valley and Pine Valley, which drain into the Humboldt River. Pine Creek represents the most significant watercourse crossing of this segment. Most of the minor watercourse crossings have low to moderate gradients. Some of the crossings of watercourses in the Cortez Mountains have high gradients. Flood hazards occur in Scotts Gulch and at the crossing of Pine Creek. Flash flood hazard potentially may exist at the crossing of watercourses in Pine Valley draining the eastern side of the Cortez Mountains.

This segment would be located mostly in valley and alluvial fan areas with gentle to moderate stream gradients. The segment would cross 15 low gradient channels, 37 gentle gradient watercourses, 5 medium gradient watercourses, and 1 high gradient watercourse. The segment would cross three mountain or hill areas including the Cortez Mountains, Dry Hills, and the Malpais Mountains. The watercourses in these areas have mostly gentle to moderate gradients but include steep gradients locally.

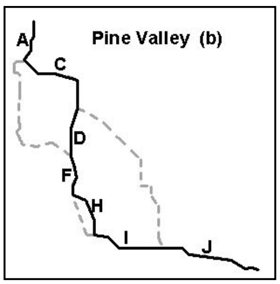
The proposed transmission line would pass relatively close to a number of springs, including two thermal springs in Whirlwind Valley and springs in Scotts Gulch in the Dry Hills. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Segment D

Segment D, part of the two Pine Valley route alternatives, would be located entirely in Pine Valley and the drainage into Pine Creek, a tributary of the Humboldt River. Pine Creek is the largest stream crossed by this segment. The segment crosses 13 low gradient, 12 gentle gradient, and 1 medium gradient channel, all small tributaries of Pine Creek that drain primarily the eastern slopes of the Cortez Mountains and the upper end of Pine Valley. The entire area is one of gentle gradient watercourses, mostly located on the valley floor. Flood hazard is most prevalent along Pine Creek. Minor flash flood hazard is potentially present in the watercourses from Sheep Creek northward, which receive their source water in the Cortez Mountains and have somewhat steeper gradients. In general, the segment does not impinge closely on any springs or wells. Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Summary – Pine Valley (a)
Pine Valley (a) would cross 271 USGS blue-line watercourses, 2 springs within 500 feet, 3 wells within 500 feet, and 19 springs/wells within 0.25 mile. This is the highest number of USGS blue-line watercourses crossed by any of the five route alternatives. There is no substantial difference between alternatives with regard to the number of springs and wells within 500 feet or within 0.25 mile. Like all alternatives, this route includes a crossing of the Humboldt River. This route avoids passing through a hot springs area. Potential adverse impacts can be reduced to a less-than-significant level by implementing Mitigation Measure Water-1 through -9.

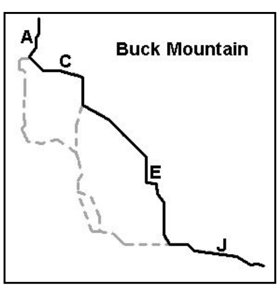
Pine Valley (b) Route Alternative



The Pine Valley (b) route alternative is comprised of Segments A, C, D, F, H, I, and J. It follows a nearly identical alignment with the Pine Valley (a) route, except that it uses Segment H rather than Segment G, traversing the east side of Whistler Mountain rather than the west. The Pine Valley (b) route shares the impacts common to all route alternatives (i.e., Impact Water-1 through -9) and the impacts associated with Pine Valley (a) route, except it would involve impacts associated with Segment H rather than in Segment G, both of which are described above.

Summary – Pine Valley (b)
In summary, Pine Valley (b) would cross 256 USGS blue-line watercourses, 2 springs within 500 feet, 2 wells within 500 feet, and 18 springs/wells within 0.25 mile. The number of watercourse crossings is less than that for Pine Valley (a). There is no substantial difference between alternatives with regard to the number of springs and wells within 500 feet or within 0.25 mile. Like all alternatives, this route includes a crossing of the Humboldt River. This route avoids passing through a hot springs area. Potential adverse impacts can be reduced to a less-than-significant level by implementing Mitigation Measure Water-1 through -9.

Buck Mountain Route Alternative



The Buck Mountain route alternative is comprised of Segments A, C, E, and J. It shares the Impacts Common to All Route Alternatives (Impact Water -1 through –9). Buck Mountain is the only route that uses Segment E, which is described below.

Segment E
Segment E, which is only associated with the Buck Mountain route alternative, would cross Pine Valley and Huntington Valley, both of which are tributary streams of the Humboldt River. The segment also would cross Diamond Valley and Newark Valley, both of which have closed internal drainage. The segment would cross 103 USGS blue-line watercourses, most of which are small drainage features with gentle gradients on fan slopes and valley bottoms. The segment would cross 89 gentle gradient

watercourses and 14 low gradient channels (including one braided channel of Pine Creek). The largest stream crossings would be Pine Creek and Huntington Creek, both of which have relatively wide floodplain areas in the reaches where Segment E would cross. Pine Creek is a braided stream. Flash flood hazard is potentially present in the watercourses from Dry Creek (Sulphur Spring Range), Cherry Spring Canyon, and watercourses draining the Ruby Range and Diamond Mountains, as well as some watercourses draining the Buck Mountains. Watercourses that would be crossed in mountains areas of the Sulphur Spring Range, Pinyon Range, and Buck Mountains have mostly moderate gradients but locally steep gradients.

The segment would pass up-gradient and within 0.25 mile of the reservoir at Warm Springs Ranch. Construction activities could potentially impact the water quality of the reservoir. The segment would pass within 500 feet of a well near milepost 70 and come relatively close to a number of springs and wells, especially at Railroad Pass. The segment would come within about 0.3 mile of Wouldiams Spring. Special care should be taken during construction to implement Mitigation Measures Water 6A and 6B in those spring and well areas.

Potential hydrologic impacts and mitigation measures would be similar to those presented in Impacts Common to All Route Alternatives.

Summary – Buck Mountain

In summary, the Buck Mountain route alternative would cross 179 USGS blue-line watercourses, 2 springs within 500 feet, 3 wells within 500 feet, and 10 springs/wells within 0.25 mile. These numbers represent the fewest hydrological features associated with any of the route. Like the other alternatives, this Route would cross the Humboldt River and includes crossing the wide braided channel of Pine Creek. Potential adverse impacts can be reduced to a less-than-significant level by implementing Mitigation Measure Water-1 through -9.

Summary Comparison of Route Alternatives

TABLE 3.3-4: SUMMARY OF IMPACTS BY ROUTE ALTERNATIVE

Impact	Crescent Valley (a)	Crescent Valley (b)	Pine Valley (a)	Pine Valley (b)	Buck Mountain
Impact Water-1: Potential Spills or Discharges During Construction	X	X	X	X	X
Impact Water-2: Erosion and Sediment from Construction	X	X	X	X	X
Impact Water-3: Potential Watercourse Obstruction	X	X	X	X	X
Impact Water-4: Soil Compaction and Increased Runoff	X	X	X	X	X
Impact Water-5: Potential Damage to Spring and Wells	X	X	X	X	X
Impact Water-6: Flash Flood Hazard to Towers	X	X	X	X	X
Impact Water-7: Access Road Impacts	X	X	X	X	X
Impact Water-8: Humboldt River Crossing Inundation Hazard	X	X	X	X	X
Impact Water-9: Potential Discharges to Humboldt River	X	X	X	X	X

RESIDUAL IMPACTS

After mitigation, there would be minor residual impacts to water resources, principally sediment discharges following construction. With the applied mitigation, the sediment discharges would not be greater than background levels of sediment transport and deposition; therefore, the impact would be less-than-significant. As noted, if dewatering is required for construction, some impacts would be expected on nearby wells. Recovery of water levels may require some time, but most wells probably would have normal flow restored relatively rapidly. Therefore, the residual impact would be less-than-significant.

Towers placed on alluvial fans and in floodplains would be subject to residual hazards of inundation and possible damage from flash flooding. A severe flash flood or substantial stream flood event could tip a tower or damage it, which would potentially impair operation of the transmission line for a period of time The impact cannot be entirely eliminated by mitigation; however, mitigation identified in this EIS would provide an acceptable level of risk. Therefore, the impact is considered to be less-than-significant.

NO ACTION ALTERNATIVE

Under the No Action Alternative, potential impacts to hydrological resources associated with this project would not occur. However, hydrological impacts could occur in other areas as SPPC and the Nevada PUC would begin emergency planning efforts to pursue other transmission and/or generation projects to meet the projected energy shortfall.